



Oregon

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Also Sent Via E-mail

Mr. Robert J. Wyatt
Northwest Natural Gas Company
220 N.W. Second Avenue
Portland, OR 97209

**Re: Preliminary Design Report
Shoreline Segments 1 and 2, NW Natural Property and the Northern Portion of the
Siltronic Corporation Property
Portland, Oregon
ECSI No. 84**

Dear Mr. Wyatt:

The Department of Environmental Quality (DEQ) reviewed the "Preliminary Design Report – Groundwater Source Control, NW Natural Gasco Site" dated June 2008 (Preliminary Design Report). Anchor Environmental, LLC (Anchor) prepared the Preliminary Design Report on behalf of NW Natural. The Preliminary Design Report summarizes the current status of groundwater and riverbank removal action (i.e., source control measures) planning and design.

BACKGROUND

DEQ has determined the shoreline of the property owned by NW Natural (NW Natural Property, or Gasco Site) and the northern portion of the Siltronic-owned property (Siltronic Property) are high priorities for source control. The portion of the shoreline identified as the highest priority for source control (Segment 1) extends from downstream of the "Tar Body Removal Area"¹ (TBRA) on the NW Natural Property, to upstream of the former Gasco manufactured gas plant (MGP) effluent overflow ponds on the Siltronic Property. This segment coincides with the heaviest MGP-related impacts identified near the river, including dense non-aqueous phase liquids (DNAPLs), impacted riverbank soils, and contaminated groundwater. It also includes the portion of the Siltronic Property where groundwater contamination caused by Siltronic has commingled with DNAPLs and groundwater contamination resulting from former Gasco MGP operations. The segment of NW Natural's shoreline between the TBRA and NW Natural's downstream property line with US Moorings (Segment 2) is considered a high priority for source control, primarily due to the presence and concentrations of MGP chemicals of interest (COI), particularly cyanide, in riverbank soils and groundwater. A third shoreline segment (Segment 3) extends from upstream of the former effluent ponds to the upstream Siltronic Property line. A source control evaluation of Segment 3 is ongoing and is projected for completion before the end of the year.

¹ The "Tar Body Removal Area" and former effluent ponds are features associated with the historic operation of the former Gasco MGP. The TBRA was subject to an EPA early action conducted in the late-summer/early-fall 2005.

NW Natural completed the Groundwater/DNAPL FFS in November 2007². The Groundwater/DNAPL FFS presented NW Natural's evaluation of source control measures (SCMs) alternatives to mitigate migration of groundwater contamination and the movement of DNAPLs to the Willamette River and its sediments. DEQ approved NW Natural's recommended SCMs alternative that combined a hydraulic control/containment system along the shoreline of the NW Natural Property and the northern portion of the Siltronic Property, with a vertical barrier in the southern portion of the NW Natural Property. DEQ's approval was subject to the conditions and comments detailed in a March 21, 2008 letter (March 21st Letter) regarding the Groundwater/DNAPL FFS.

As noted in the Preliminary Design Report, NW Natural and DEQ participated in a series of meetings to work through the more substantive issues identified in the March 21st Letter. The meetings were intended to streamline the SCMs planning and design process. The Preliminary Design Report is supposed to: 1) reflect the status of SCMs planning and design based on the outcomes of the meetings; and 2) provide the basis for moving forward into design. The initial design document (i.e., the "Interim Design Report") will include the findings and results of ongoing (groundwater treatability study) and future studies (vibration study, DNAPL movement/mobility evaluation, DNAPL removal pilot study), being conducted to support SCMs design.

DEQ comments regarding the Preliminary Design Report are provided below and are intended to clarify DEQ's understanding of the agreements reached during planning meetings, and our position on certain aspects of the SCMs planning and design process.

GENERAL COMMENTS

DNAPL Movement and Mobility Evaluation

DEQ made it clear in numerous meetings and correspondence that evaluations of the nature and extent of DNAPL and DNAPL mobility are needed to finalize the location, alignment, and dimensions of the vertical barrier. The DNAPL evaluation would also support planning and design of other source control measures, including assessing the influence of hydraulic control/containment on DNAPL movement, and developing DNAPL removal schemes. In the March 21st Letter and in follow-up meetings, DEQ provides guidance on methods NW Natural could use to evaluate DNAPL movement/mobility. Furthermore, in letters dated July 12, and August 29, 2006, NW Natural recommends approaches for assessing DNAPL mobility and containment under conditions of changing hydraulic gradients, which are, in part, information items identified by DEQ for the DNAPL movement/mobility evaluation.

To date, NW Natural has not attempted to carry out the DNAPL evaluations. Section 3.3 of the Preliminary Design Report indicates that with regard to evaluating whether the vertical barrier will prevent DNAPL from migrating beyond the wall to the river, "Unfortunately, NW Natural is not aware

² Anchor Environmental, LLC, 2007, "Groundwater/DNAPL Source Control Focused Feasibility Study – NW Natural 'Gasco' Site," October 12 (amended November 9th), and report prepared for NW Natural.

of any reliable, proven method to make such a demonstration of DNAPL behavior under similar circumstances.”

DEQ continues to consider DNAPL movement/mobility important for establishing basic design parameters of the vertical barrier, particularly the depth. Absent an evaluation of DNAPL nature, extent, and movement under ambient and SCMs operating conditions DEQ cannot approve the vertical barrier depicted in Figure 4 of the Preliminary Design Report.

Given the lack of progress to date and lacking a commitment by NW Natural, DEQ will perform a DNAPL evaluation with the specific objective of assessing the depth of the vertical barrier proposed in the Preliminary Design Report (i.e., between -50 and -60 feet mean sea level [msl]). NW Natural should be advised the DNAPL evaluation could indicate the proposed depth of the vertical barrier is insufficient. If this is the case, NW Natural may have to conduct additional vibration testing with equipment able to achieve greater vertical barrier construction depths.

For clarification, DEQ continues to expect NW Natural to conduct an evaluation of DNAPL movement/mobility to support the hydraulic control/containment and DNAPL removal systems planning and design process. This DNAPL movement/mobility evaluation referenced in this paragraph is separate from, and broader in scope than the evaluation described above that focuses on assessing the depth of the vertical barrier. DEQ will consider hydraulic containment system and DNAPL removal planning and design incomplete without such an evaluation.

Within 14 days receipt of this letter, NW Natural should indicate their commitment to perform the DNAPL movement/mobility evaluation by submitting an outline of the approach. Absent a commitment from NW Natural to perform the evaluation DEQ will conduct the work.

DNAPL Removal Pilot Testing

NW Natural proposes to conduct DNAPL removal pilot tests at two locations (Targost® borings TG-8 and TG-13), using vertical wells designed for this purpose. As proposed the wells will be screened over the entire thickness of DNAPL identified from Targost® logs (i.e., from just above the base of the fill unit, through the silt unit, and into the upper-most alluvium). DEQ understands pilot testing will be conducted to assess the influence of gradient changes on DNAPL movement. DNAPL movement will be inferred based on the measured differences between DNAPL accumulation in the pilot wells under non-pumping and pumping conditions. DEQ further understands NW Natural will use this information to: 1) interpret whether operation of the hydraulic control/containment system could increase DNAPL movement beneath the ponds, and 2) assist in the design of the numbers and types of wells that will be constructed in the former effluent pond areas.

The data collection objectives of the pilot tests are too narrow for purposes of developing an approach to remove DNAPL from beneath the former effluent ponds (i.e., reduce DNAPL “head” beneath the ponds). More specifically, the pilot test should assess the occurrence of DNAPL at the base of the fill that could be feeding DNAPL migrating vertically downward through the silt and into the alluvium. Absent DNAPLs controls in the fill water-bearing zone (WBZ), constructing and operating extraction

wells through and/or below the silt unit has the potential for increasing downward vertical migration of DNAPL. Additionally, there is insufficient information provided in the Preliminary Design Report regarding how the pilot tests will achieve the two data collection objectives listed above. For example, discussions of how the data collected during the pilot tests will be used to assess DNAPL removal alternatives (e.g., trenches, vertical wells, horizontal wells); or estimate design parameters for DNAPL removal (e.g., radius of extraction well influence, the density, numbers, and locations of DNAPL recovery wells) should be provided. The pilot study should also discuss how installation of the pilot wells could influence interpretations of DNAPL accumulation rates.

Planning for DNAPL removal in the former effluent pond areas is in the early stages. Based on our initial review of the Preliminary Design Report, DEQ approved the locations of the pilot tests and requested NW Natural to revise the scope of work by developing more detailed plans for drilling and installing the vertical pilot DNAPL recovery wells. Drilling and installation methods should consider the stratigraphy of the fill and alluvial units and further assess the occurrence of DNAPL at the base of the fill. Preparation of the revised plan is ongoing.

DEQ expects NW Natural to include two phases in the pilot test to assess: 1) the occurrence of DNAPL in the fill unit, and DNAPL removal from the base of the fill WBZ, and 2) DNAPL removal from the upper alluvial WBZ (Targost® logs provide information regarding the occurrence of DNAPL in the upper alluvial WBZ). Prior to conducting pilot tests, DEQ expects the data collection objectives to be refined by evaluating DNAPL nature, extent, and volume beneath the former effluent ponds by compiling Targost® logging data onto geologic cross-sections. Cross-sections should be prepared throughout the footprint(s) of the former effluent pond areas on both the NW Natural and Siltronic properties.

Sequencing Source Control Measures

The Preliminary Design Report describes the status of ongoing planning for each principal element of the source control project. The document also provides a schedule for the overall source control project that anticipates SCMs construction occurring between June and November 2009. The major elements of source control (vertical barrier, hydraulic control/containment, and DNAPL removal) are intended to operate as integrated elements. In other words each element will be designed to enhance the effectiveness of the other measure(s). Planned sequencing of SCMs implementation can further increase effectiveness. The Interim Design Report should present NW Natural's plan for sequencing implementation of integrated SCMs. For example, DNAPL removal in advance of starting up the groundwater extraction system near the shoreline, increases the potential for DNAPL movement to be controlled/contained.

Riverbank Source Control

DEQ maintains the expectation that riverbank stabilization/remediation should be included along with the vertical barrier, hydraulic control/containment, and DNAPL removal, as a principal element of the overall source control project (i.e., riverbank source control would be implemented within a similar timeframe). In Section 1.2 of the Preliminary Design Report, NW Natural proposes conducting the

riverbank source control measures alternatives evaluation as part of the uplands FS, and implementing the selected alternatives as remedial actions during the in-water action overseen by EPA.

NW Natural's rationale for including the riverbank in the FS has many positive aspects, including freeing up resources to implement higher priority DNAPL and groundwater SCMs (i.e., vertical barrier, and hydraulic control/containment and DNAPL removal systems); taking advantage of in-water action permits; and conducting work within the protective measures established for the in-water action. However, DEQ cannot approve NW Natural's proposal at this time as it influences work being contemplated by EPA. As such, EPA must evaluate how NW Natural's riverbank source control proposal influences in-water action planning, including the draft Gasco sediments cleanup action statement of work being developed.

Additionally, for a riverbank remedial action to be selected and implemented as NW Natural envisions, it must be an approach that can be permitted. Before DEQ approves the proposal, NW Natural will need to consult with agencies involved in the permitting process, including, but not necessarily limited to, US Fish and Wildlife, Army Corps of Engineers, National Marine Fisheries Service, Oregon Department of State Lands, Oregon Department of Fish and Wildlife, and City of Portland Bureau of Development Services.

Based on the information summarized above, NW Natural needs to begin laying the groundwork for the riverbank proposal by preparing a work plan for planning the riverbank preliminary design. The document should include but should not be limited to, the information requested in the March 21st Letter. This document should provide the basis for planning the riverbank project, whether it is done under DEQ or EPA oversight, and inform other involved agencies regarding the scope of the project.

SPECIFIC COMMENTS

Section 1.2.1. DEQ previously concurred with NW Natural that source control measures intended to mitigate migration of DNAPL and contaminated groundwater to the river are higher priorities than the riverbank element. Furthermore, DEQ acknowledges it is likely given planning and permitting needs, the riverbank source control element will be implemented after the vertical barrier and hydraulic control/containment system. However, DEQ strongly disagrees with language in the section that implies the presence of the vertical barrier and/or hydraulic control/containment system can be used to limit the riverbank SCMs alternative evaluation.

The Preliminary Design Report suggests that prioritizing installation of the vertical barrier potentially justifies a reduced bank stabilization effort. For example, NW Natural indicates that, "DEQ has also verbally commented that engineering approaches to deal with the presence of the wall might drive up the costs of larger scale river bank soil removal alternatives, and thus make them less likely to be selected as preferred alternatives in future evaluations." For clarification, DEQ's position regarding riverbank source control remains consistent with our March 21st Letter in which implementation of the vertical barrier and hydraulic control/containment system is made contingent on satisfying two conditions: 1) future riverbank work will not interfere with implementation of these SCMs; and 2)

these SCMs preserve maximum flexibility in accommodating the range of options for bank soil and river sediment removal and/or stabilization.

DEQ's continues to maintain the most cost effective and environmentally beneficial source control strategy is one that fully integrates the vertical barrier, hydraulic control/containment, and riverbank elements. Planning and design of these source control element separately risks increasing project costs and/or diminishing environmental benefits. Based on meetings discussions, DEQ understood there was agreement that future SCMs alternatives evaluations of the riverbank would be done as if the vertical barrier and hydraulic control/containment system had not been constructed. In other words, any additional costs incurred as a result of working around the vertical barrier and extraction wells, would not be a limiting factor in the riverbank SCMs alternatives evaluation. DEQ expects NW Natural to carry this understanding forward when planning the riverbank source control element.

Section 1.2.2. DEQ concurs with NW Natural's proposed sequence of activities up to the third bulleted item. The third bullet should indicate the information requested by DEQ will be used to prepare a work plan for conducting riverbank planning and preliminary design. As discussed above, the work plan will provide the basis for planning the riverbank project, whether it is done under DEQ or EPA oversight, and inform other involved agencies about the scope of the project.

Section 2.2. DEQ envisions the Interim Design Report to be the equivalent of a 60% design document that fully considers and incorporates the results of design studies, and establishes the final overall design parameters and configurations of the SCMs. Besides DEQ, the report will be reviewed by EPA and Portland Harbor stakeholders. Subsequent to receiving comments and revising the submittal, the Interim Design Report will be made available for public review and comment.

Section 3.1, 1st bullet. The RAO for groundwater should be restated to say that the hydraulic control/containment system will achieve "...complete hydraulic capture of upland groundwater." This revision is more consistent with SCM performance monitoring objectives, which will assess hydraulic capture directly by measuring groundwater levels in extraction wells, monitoring wells, and piezometers. The RAO should be revised in future submittals.

Section 3.1, 3rd bullet. Although not mentioned here, DEQ's March 21st Letter points out the RAOs identified in the Groundwater/DNAPL FFS for Segment 1 did not address the fill WBZ. The March 21st Letter informs NW Natural that controlling and containing groundwater in the fill WBZ should be included in planning and design of the vertical barrier (i.e., engineering controls on the upland side of the barrier to prevent DNAPL and/or contaminated groundwater from moving over or around the barrier). Furthermore under "General Comments," the letter communicates DEQ's expectation that control/containment of groundwater in the fill WBZ will be an RAO for riverbank source control along segments 1 and 2. Future submittals should include this information in discussions of SCMs project RAOs.

Section 3.1, last bullet. Although DEQ's March 21st Letter indicated NW Natural should control and contain DNAPL migration resulting from operation of the hydraulic control/containment system,

upland DNAPL removal should prevent DNAPL discharges to the river regardless of the mechanism driving its transport.

Section 3.3, 2nd paragraph. NW Natural implies DEQ has accepted the location and construction method for the vertical barrier. For clarification, DEQ has not agreed that sheet-pile is the “preferred” wall construction material (DEQ understands it is NW Natural’s preferred construction method). DEQ’s position on the vertical barrier construction methods has not changed from the March 21st Letter, which indicates the design parameters and construction method(s) of the vertical barrier and hydraulic control/containment system will be determined subsequent to completion of additional field investigations and SCMs planning and design studies (i.e., supplemental Targost® work, DNAPL mobility evaluation, and vibration study).

The supplemental Targost® work has been completed and is included in the Preliminary Design Report. The vibration study is in the final planning stages, and the DNAPL mobility evaluation has not been initiated. Until vertical barrier planning studies have been completed, construction methods and design parameters (location, alignment, and dimensions) cannot be finalized.

Section 3.3, 5th paragraph. Although the vibration study and DNAPL movement/mobility evaluation have not been performed, NW Natural proposes a vertical barrier design with depths ranging between -50 and -60 feet msl. The “alternative” barrier is projected to be 10 feet below the current channel (-50 feet msl), and is deepest (-60 feet msl) where the deepest occurrence of DNAPL has been observed.

NW Natural suggests the feasibility of constructing the “alternate” vertical barrier remains to be evaluated by indicating that, “During interim design NW Natural will reevaluate the feasibility of installing the barrier to the alternative depth described above.” The SCMs alternative evaluation completed by NW Natural during the Groundwater/DNAPL FFS previously determined sheet-pile and slurry wall construction methods were feasible for use at the site. In the March 21st Letter, DEQ informed NW Natural that until planning studies were complete, a vertical barrier depth of -60 feet msl should be used for planning purposes. Based on meeting discussions, DEQ understood NW Natural expected to achieve this depth by combining clearance trenching with sheet-pile and/or slurry wall construction methods. If there was uncertainty associated with using sheet-pile or slurry wall methods to construct a barrier to -60 feet msl, it should have been acknowledged and incorporated into the vibration study (i.e., mobilize additional equipment to the site for vibration testing).

Before the vibration study is initiated NW Natural should clarify: 1) what the feasibility reevaluation involves; 2) whether sheet-pile and/or slurry wall methods combined with clearance trenching are still expected to achieve a barrier depth of -60 feet msl; and 3) what influence the reevaluation has on the vibration study.

Section 3.4. NW Natural should plan to submit the well-fouling prevention plan to DEQ for review upon completion. Note, incorporating shallow groundwater extraction wells (at mid-wall depth) into the hydraulic control/containment system, and assessing different extraction well depths and arrays appear to be deferred to the interim design. DEQ expects this work to be done prior to submittal of the

Interim Design Report. For clarification, the results of the modeling work described in Section 4.1, should be provided for DEQ's information, review and comment within 45 days of receipt of this letter.

Section 3.4, last paragraph page 12. As discussed under General Comments, NW Natural should evaluate DNAPL movement/mobility as part of the hydraulic control/containment system planning and design process. The results of this evaluation should be considered in assessments of alternate extraction well depths and arrays.

Section 3.6. There appears to be a misunderstanding between NW Natural and DEQ regarding the current status of the groundwater treatment system analyte list and discharge concentrations. The analyte list and discharge concentrations shown on Table 1 of Appendix B are from the final Koppers individual NPDES permit. For clarification, the table was provided to NW Natural during a meeting on January 15, 2008 for informational purposes only (i.e., the table does not represent a DEQ "proposal" for analytes and discharge criteria for the Gasco Site).

The analyte list and discharge limits for the groundwater treatment system currently being designed, will be based on: 1) the results of the ongoing treatability studies; and 2) evaluations of discharging treated water consistent with the requirements of an individual NPDES permit application (e.g., using treatability study results to perform a "reasonable potential analysis").

Section 4.1. As noted above, the modeling work described in this section of the Preliminary Design Report should be submitted to DEQ within 45 days of NW Natural's receipt of this letter. This will allow DEQ to review the work, and for our more substantive comments to be considered during preparation of the Interim Design Report.

Section 4.1.2. It should be noted that the highest groundwater discharge rates do not necessarily coincide with the lowest river stage. Reasonable worst-case scenarios should be based on periods of times corresponding to the highest hydraulic gradient between the uplands and the river, rather than periods of lowest river stage.

Section 4.2.1. DEQ considers it premature at this stage of planning to limit the list of technologies available for removing DNAPL from beneath the former effluent ponds. For example, use of horizontal wells is supported by Targost® logs (e.g., TG-8) that have identified relatively thick, laterally connected vertical intervals of mobile DNAPL within and beneath the silt unit. In addition, the silt unit provides a relatively shallow surface above which DNAPL could be removed using trenching methods.

Section 4.5. DEQ will expect figures and the particle tracking evaluation described in this section of the report to be completed with 30 days of receipt of this letter. This will allow portions of the NW Natural and/or Siltronic plumes occurring outside of the projected hydraulic control/containment system capture zone to be identified before the Interim Design Report is submitted.

Figure 1. The extraction well designations should be numbered sequentially to facilitate discussions of the network.

Figures 5, 6, and 7. Figure 4 indicates the bottom of the vertical barrier extends to -50 feet msl or greater. It appears that the depth of the vertical barrier shown on figures 5, 6, and 7 is closer to -40 feet msl. The figures should be reviewed and revised accordingly.

Figures 4, 5, 6, and 7. These figures appear to rely on: 1) geologic observations made during the most recently completed geotechnical drilling to monitoring well installation work, and 2) DNAPL intervals identified during Targost® logging work. Regarding DNAPL occurrence, at a number of monitoring well locations (e.g., WS-14), sheen observed during drilling preceded DNAPL entering the installation. The figures should be revised to include depths intervals where evidence of DNAPL (e.g., sheen) was observed during all drilling work completed near the alignment of the proposed vertical barrier (e.g., borings B-29, B-31, B-55, B-58, B-59).

Note that geotechnical borings shown figures 4 and 6 use boring designations used previously for exploratory borings in the northern portion of the Gasco Site. Geotechnical borings should be renamed to avoid confusion in future submittals.

NEXT STEPS

DEQ is not requesting the Preliminary Design Report to be revised and resubmitted. DEQ expects the following responses to be prepared by NW Natural within the timeframes indicated.

- Within 14 days and prior to scheduling equipment for the vibration study, NW Natural will clarify:
1) what the feasibility reevaluation of the alternative barrier design involves; 2) whether sheet-pile and/or slurry wall methods combined with clearance trenching are still expected to achieve a barrier depth of -60 feet msl; and 3) what influence the feasibility reevaluation has on the vibration study;
- Within 14 days receipt of this letter, NW Natural will indicate their commitment to perform a DNAPL movement/mobility evaluation by submitting an outline of the approach; and
- Within 45 days of receipt of this letter NW Natural will:
 - Develop cross-sections aligned near the top of the bank that: 1) depict groundwater contamination associated with releases from the NW Natural and Siltronic properties, and 2) the results of particle tracking simulations showing the overlap of groundwater contamination and the hydraulic control/containment system capture zone.
 - Submit the results and analysis of the modeling work described in Section 4.1.

In addition, DEQ expects NW Natural to fully incorporate the comments in this letter, into SCMs planning and design studies and the Interim Design Report.

Robert Wyatt
Northwest Natural
August 22, 2008
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DEQ acknowledges the significant amount of work the uplands SCMs and in-water sediment cleanup projects represent, and appreciate NW Natural's continued efforts to move these projects forward. Please don't hesitate to contact me if you have any questions regarding this letter.

Sincerely,

Dana Bayuk
Project Manager
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ECSI No. 83 File
ECSI No. 184 File